

Exploring Charon's Eccentric Orbit

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We previously reported on observations of the Pluto-Charon system with the Hubble Space Telescope that revealed the signature of an unexpected orbital eccentricity for Charon. Since then, we have been exploring possible origins for this eccentricity, and are attempting to confirm its existence. Possible origins that have been explored include impact, perturbation, and surface albedo distribution effects. The impact hypothesis requires a single energetic event with the potential for shattering Pluto. The perturbation hypothesis appears to have a comparable probability, but requires a significant population of trans-Neptunian bodies to interact with the system. Two models for the surface albedo distribution have been able to account for only about half of the observed eccentricity. A combination of effects may be necessary to explain the observed orbit.

To confirm the eccentricity, we have begun by combining our HST data with other HST observations of the system (Null and Owen 1996, AJ 111, 1368). These two data sets do not appear to suffer from systematic differences in their image scale determination, but the position angle calibrations may differ by about a half degree. Until any systematic differences have been eliminated, is it premature to state the eccentricity that results from a combined solution, but we hope to have such a solution by the time of the meeting. We also intend to incorporate other ground-based data sets in the orbit solution, pending elimination of systematic differences in calibration. Ultimately, we hope to acquire another set of HST observations with the corrected optics, at a significantly different epoch, and with the orbit more open.

The effects of the eccentricity on mutual event solutions for the radii will also be discussed.

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